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COPY NO. 45 **NAVAL AIR TEST CENTER**  
**REPORT OF TEST RESULTS**

FROM

Commander, Naval Air Test Center, Patuxent River, Maryland 20670

TO

Commander, Naval Air Systems Command, Washington, D.C. 20361

AIRTASK	WORK UNIT	AIRCRAFT BUNO
A5345341/0532/ 7534000001	A53411-20	159229
	REPORT SEQUENCE UNDER WORK UNIT	EFFORT LEVEL
	Second Interim	Normal

TITLE

Test and Evaluation of AH-1T Forward Ground Handling Gear Assembly (P/N 209-052-244-1);  
Second Report (Final)

DATES OF TESTS	LOCATION OF TESTS	COGNIZANT NAVAIRSYSCOM DIVISION
11-15 April 1977	NAVAIRTESTCEN	AIR-534/AIR-417
NATC PROJECT OFFICER/ENGINEER	NATC DIVISION	COGNIZANT NAVAIRSYSCOM ENGINEER
Mr. T. E. Hickey	Systems Engineering	Mr. K. Dowdy/Mr. E. Hanson

ENCLOSURES

(1) Photographs

Ref: (a) NAVAIRTESTCEN msg rpt dtg 231348Z May 77

INTRODUCTION

1. In accordance with the AIRTASK/Work Unit, the Forward Ground Handling Gear Assembly, P/N 209-052-244-1, received a limited evaluation to determine its suitability for use in support of the AH-1T aircraft. The Forward Ground Handling Gear Assembly is provided to be used in conjunction with the Rear Ground Handling Gear Assembly for ground movement of the AH-1T aircraft. The evaluation was limited in that the Gear Assembly was used for aircraft movement using gross weights of 14,200 lb (6 441 kg) and 13,200 lb (5 987 kg). Preliminary results of the evaluation are contained in reference (a).

RESULTS/REMARKS

2. The limited evaluation of the Gear Assembly consisted of:
- Conducting a visual inspection.
  - Installing the Gear Assembly, raising the skid, and movement of the aircraft in accordance with the proper procedures.

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Part I indicates a deficiency, the correction of which is necessary because it adversely affects:

- a. Airworthiness of the aircraft.
- b. The ability of the aircraft (or piece of equipment) to accomplish its primary or secondary mission (or intended use).
- c. The effectiveness of the crew as an essential subsystem.
- d. The safety of the crew or the integrity of an essential subsystem. In this regard, a real likelihood of injury or damage must exist. Remote possibilities or unlikely sequences of events shall not be used as a basis for safety items.

Part II indicates a deficiency of lesser severity than a Part I which does not substantially reduce the ability of the aircraft or piece of equipment to accomplish its primary or secondary mission, but the correction of which will result in significant improvement in the effectiveness, reliability, maintainability, or safety of the aircraft or equipment. A Part II deficiency is a deficiency which either degrades the capabilities of the aircraft or equipment or requires significant operator compensation to achieve the desired level of performance; however, the aircraft or equipment being tested is still capable of accomplishing its mission with a satisfactory degree of safety and effectiveness.

Part III indicates a deficiency which is minor or slightly unpleasant or appears too impractical or uneconomical to correct in this model, but should be avoided in future designs.

c. Installing the Gear Assembly and raising the skid using improper sequencing (raising Forward Gear Assembly first).

d. Operating the brake assembly.

3. The Forward Ground Handling Gear Assembly (enclosure (1), figure 1) consists of two full castoring wheels connected by a common trunnion with a lift mechanism and a 36 in. (91.4 cm) lever handle. The Gear Assembly is attached to two lugs on the forward portion of each skid by means of a solid pin which engages the rear lug and a quick release pin that engages the front lug in the aircraft skid. The lever handle must be held straight up in a vertical position while installing the Gear Assembly, then rotated forward and down to the horizontal position to raise the front portion of the aircraft skid.

4. An excessive force is required on the lever handle to raise the forward portion of the aircraft skid clear of the deck. A force of approximately 125 lb (556 N) is required at the end of the lever handle to raise the forward portion of the skid with the rear of the skid already in the raised position and the aircraft gross weight at approximately 14,200 lb (6 441 kg). A force of approximately 145 lb (645 N) is required at the end of the lever handle to raise the forward portion of the skid with the rear of the skid remaining on the deck and the aircraft gross weight at approximately 13,200 lb (5 987 kg). The excessive forces required to actuate the Gear Assembly coupled with an almost instantaneous change in force requirements as a function of rear skid position presents a potential safety hazard to maintenance personnel. In the event the forward Gear Assembly is in transition from lowered to raised or vice versa while the rear of the skid is being lowered, it is likely that the lever handle will become uncontrollable causing personnel injury and/or damage to the aircraft. The excessive force requirements on the lever handle is a Part I deficiency which must be corrected as soon as possible.

5. The means of stopping tire rotation are inadequate. The brake assembly consists of a cam-lever that contacts a metal pad which then presses against only one side of the pneumatic tire (enclosure (1), figure 2). Applying pressure to only one side of the tire causes tire deflection but does not prevent tire rotation. In addition, there is only one brake on each Gear Assembly which is located on the side of a caster housing. When the aircraft is being moved in one direction, the brake assembly is outboard of the tire. However, when the direction is reversed, the castored wheel rotates 180 deg placing the brake assembly on the inboard side of the tire. This type of brake assembly will result in maintenance personnel not being able to stop the aircraft in an emergency situation. The inadequate means of stopping tire rotation is a Part I deficiency which must be corrected as soon as possible.

6. There is a lack of provisions to prevent the brake assembly handle from being rotated 180 deg through the horizontal position. While the brake is off, the handle is in a vertical down position (enclosure (1), figure 2). To engage the brake, the handle must be pulled up to a horizontal position. Continuing to pull the handle up over center will place it in a vertical up position and will disengage the brake. In the up position, the handle will rest against the upper support of the wheel assembly (enclosure (1) figure 3). Maintenance personnel applying the brake and

failing to stop at the horizontal position will have their hand trapped between the brake handle and upper support of the Gear Assembly. Failure to provide a stop that will prevent the handle from being rotated through the horizontal position will result in a potential safety hazard to maintenance personnel. The lack of provisions to prevent the brake assembly handle from being rotated 180 deg through the horizontal position is a Part I deficiency which must be corrected as soon as possible.

7. There is inadequate clearance between the lever handle and top forward end of aircraft skid. Maintenance personnel are required to rotate the lever handle from a vertical up position to a horizontal down position to raise the forward portion of the aircraft skid (enclosure (1), figure 4). Once the lever handle is completely depressed downward, a quick release pin is inserted in the Gear Assembly housing to retain the lever handle (enclosure (1), figure 5). The reach from the end of the handle to the quick release pin will require maintenance personnel to move closer to the Gear Assembly which could result in their hand being directly over the top of the aircraft skid. While personnel are installing or removing the quick release pin, they will be applying as much downward pressure as they can while observing the quick release pin for adequate clearance. The combination of the downward pressure required on the handle, the distance of the quick release pin from the end of the handle, and the inherent flexing of the handle will result in a potential safety hazard to personnel as their hand can be trapped between the lever handle and top forward end of the aircraft skid. This inadequate clearance is a Part I deficiency which must be corrected as soon as possible.

8. The shoulder bushings, in the housing where the quick release pin for securing the lever handle in the down position is inserted in the Gear Assembly, are incorrectly installed and of insufficient length. The two bushings are installed with the shoulders inboard and do not extend to the outer surface of the housings (enclosure (1), figure 6). This results in the quick release pin jamming in the housing. Also, the bushing could be pulled out of the housing by the quick release pin which would result in an abrupt raising of the lever handle and dropping of the aircraft skid. The incorrectly installed and insufficient length of the shoulder bushings constitutes a Part II deficiency which should be corrected as soon as practicable.

9. The length of the wire rope assemblies that secure the two quick release pins to the Gear Assembly is excessive. One quick release pin is used for securing the Gear Assembly to the aircraft skid front lug and the other quick release pin is used for securing the lever handle in the down position (enclosure (1), figure 6). These pins are different lengths and if interchanged will not function satisfactorily. The length of the wire rope assemblies allow either pin to be used for either application which results in a "MURPHY" situation. Also, the quick release pin could be damaged as a result of being caught under the skid while lowering the aircraft. The excessive length of the wire rope assemblies constitutes a Part II deficiency which should be corrected as soon as practicable.

10. There is a lack of support for both ends of quick release pin. The forward attachment point for securing the Gear Assembly to the aircraft skid (enclosure (1), figure 6) consists of a bushed hole in the gear housing. A quick release pin is inserted through the bushed hole and a hole in the aircraft skid front lug. The aircraft weight is exerted on the quick release pin which is not supported at both ends and results in a bending moment being applied to the quick release pin. Failure to support the quick release pin at both ends so that a shear load is applied to the pin will cause excessive bushing wear and pin deformation which will result in the inability to secure the wheel assembly to the aircraft. The lack of support for both ends of the quick release pin is a Part II deficiency which should be corrected as soon as practicable.

11. The tire tread appears to be wearing unevenly after the Gear Assemblies were used a limited number of times for movement of the aircraft. The uneven wearing of the tire treads is a Part III deficiency which should be avoided in future designs.

## CONCLUSIONS

### GENERAL

12. Within the scope of these tests, the Forward Ground Handling Gear Assembly (P/N 209-052-244-1) is unsuitable for use because of four Part I deficiencies.

### PART I DEFICIENCIES

13. Excessive force requirements on lever handle while raising and lowering forward end of skid (paragraph 4).

14. Inadequate means of stopping tire rotation (paragraph 5).

15. Lack of provisions to prevent the brake assembly handle from being rotated 180 deg through the horizontal position (paragraph 6).

16. Inadequate clearance between lever handle and top forward end of aircraft skid (paragraph 7).

### PART II DEFICIENCIES

17. Incorrect installation and insufficient length of quick release pin shoulder bushings (paragraph 8).

18. Excessive length of quick release pin wire rope assemblies (paragraph 9).

19. Lack of support for both ends of the forward attachment point quick release pin (paragraph 10).

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PART III DEFICIENCY

20. Uneven wearing of the tire tread (paragraph 11).


RECOMMENDATIONS

GENERAL

21. Correct the Part I deficiencies cited in paragraphs 13 through 16 as soon as possible.

22. Correct the Part II deficiencies cited in paragraphs 17 through 19 as soon as practicable.

23. Avoid the Part III deficiency cited in paragraph 20 in future designs.

  
C. J. BERTHE, JR.  
By direction

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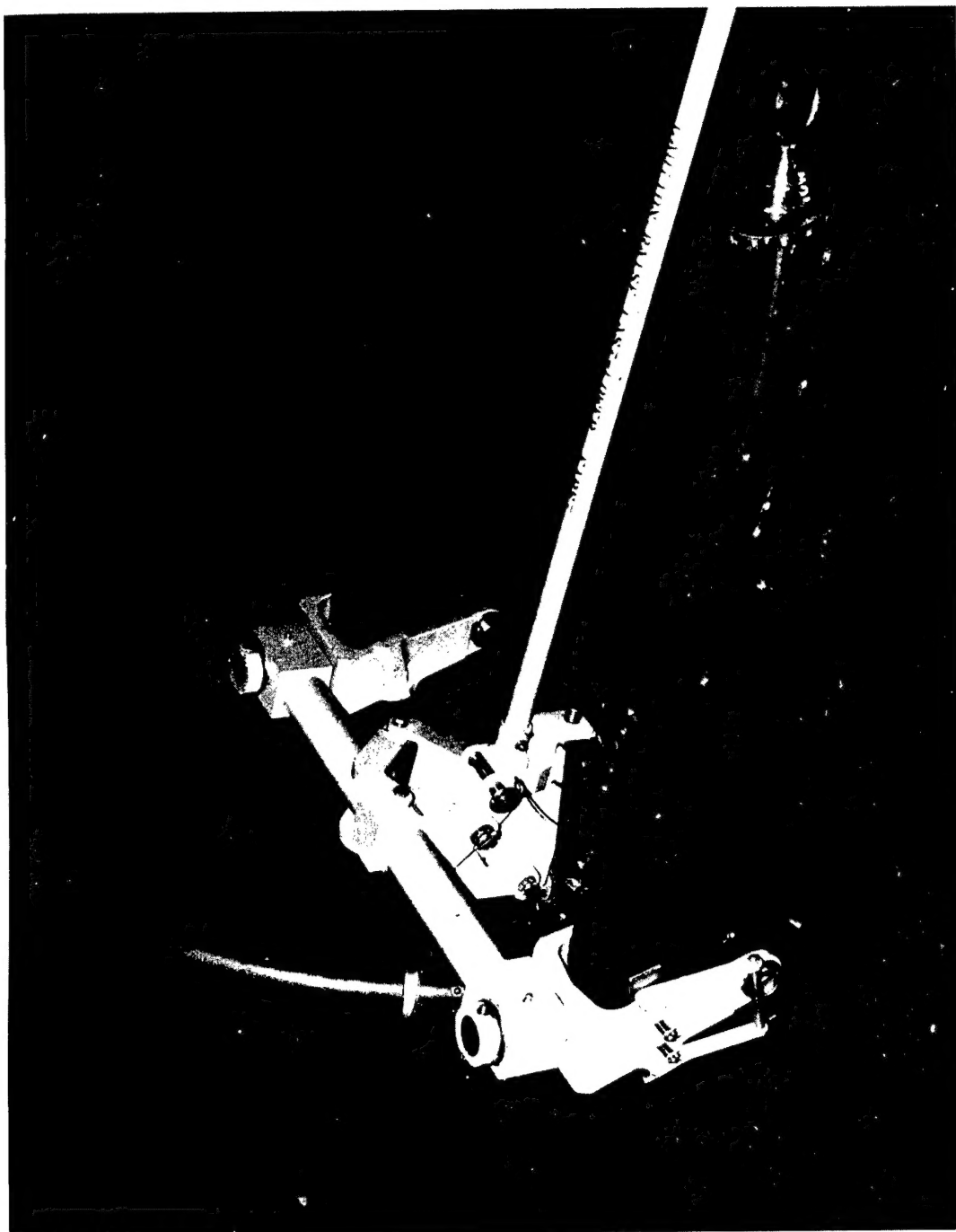


Figure 1  
Forward Ground Handling Gear Assembly (P/N 209-052-244-1)

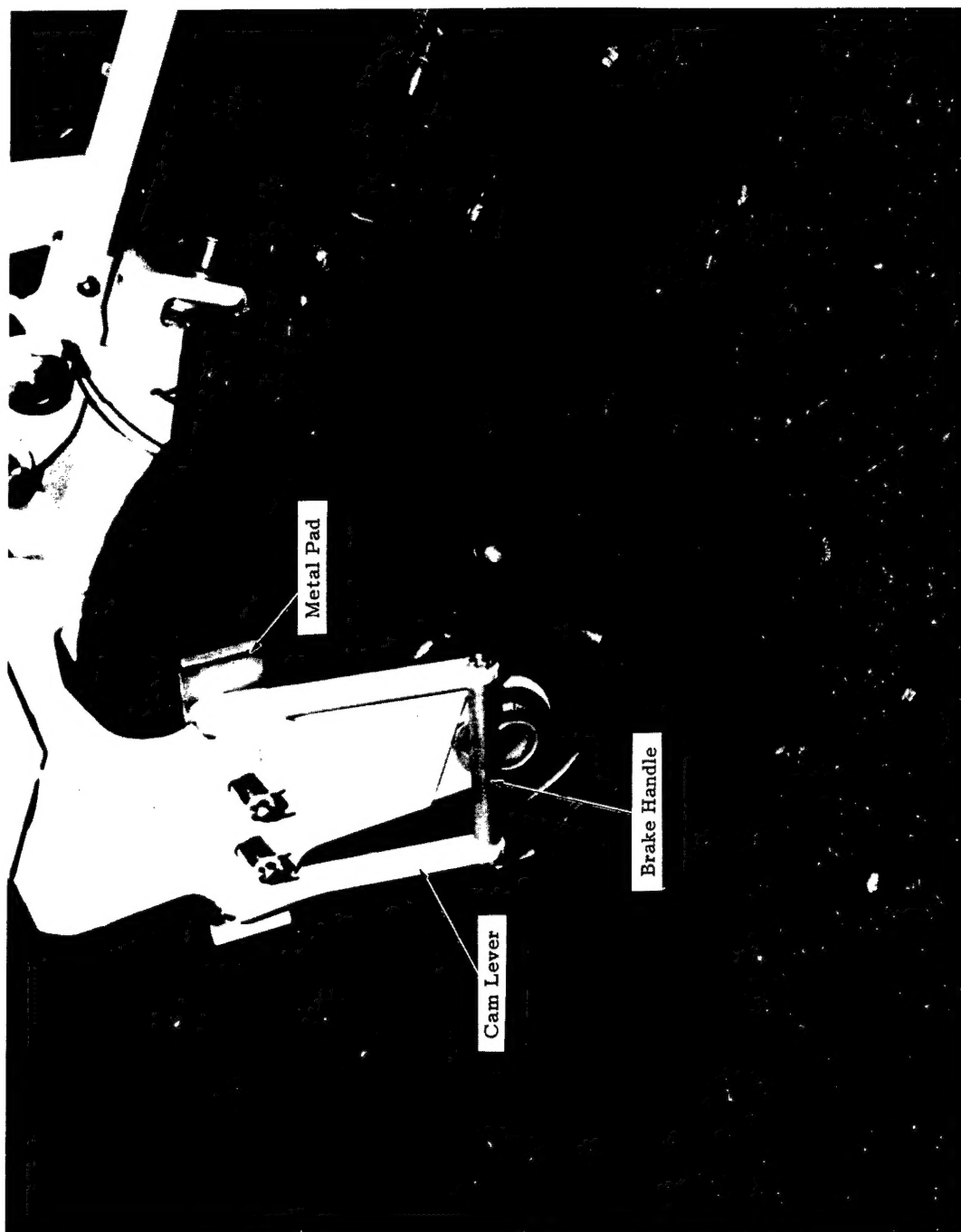


Figure 2  
Brake Assembly





Figure 3  
Interference Between Brake Handle and Upper Support



Figure 4  
Raising Forward End of Aircraft Skid

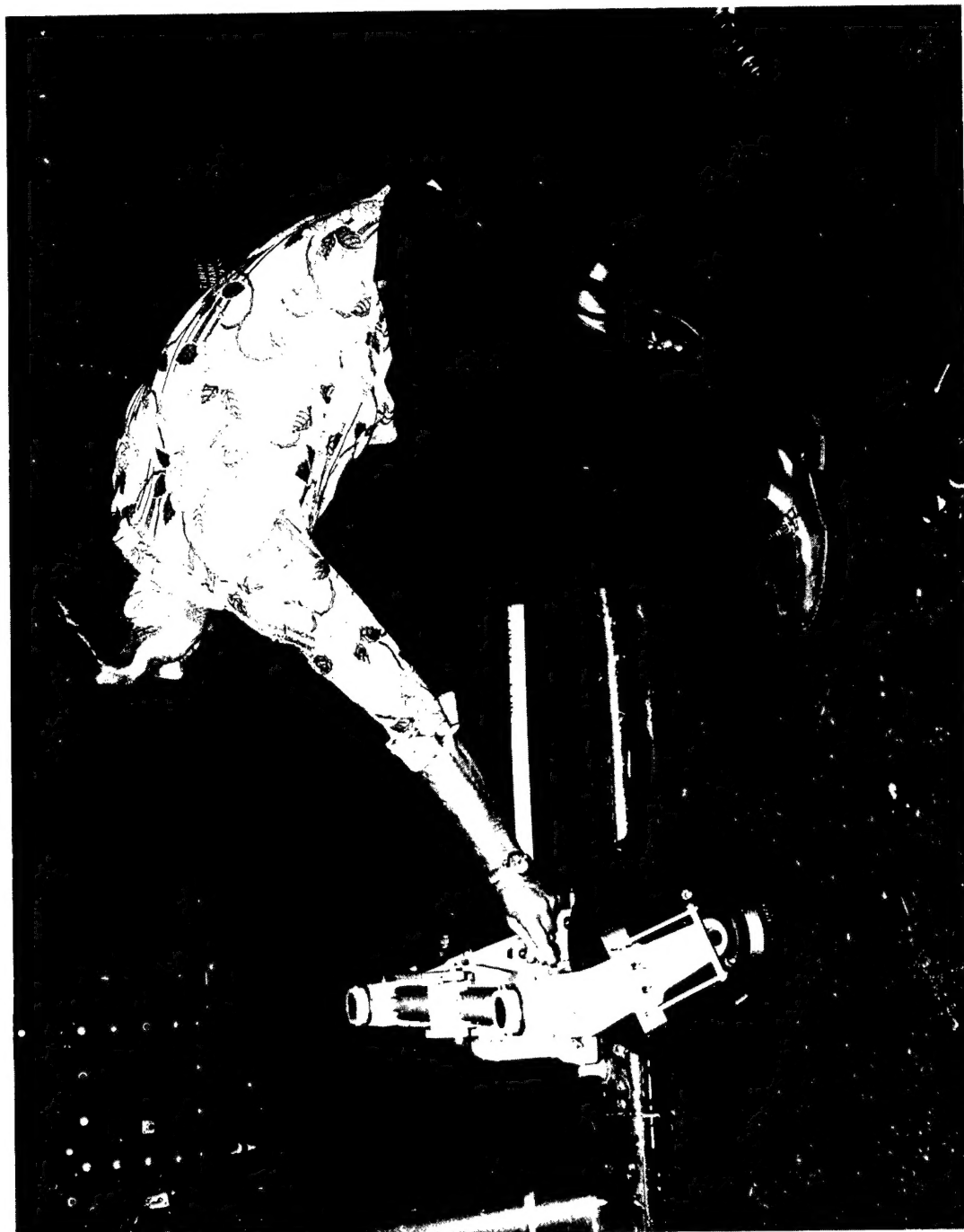


Figure 5  
Inserting Quick Release Pin in Gear Assembly Housing

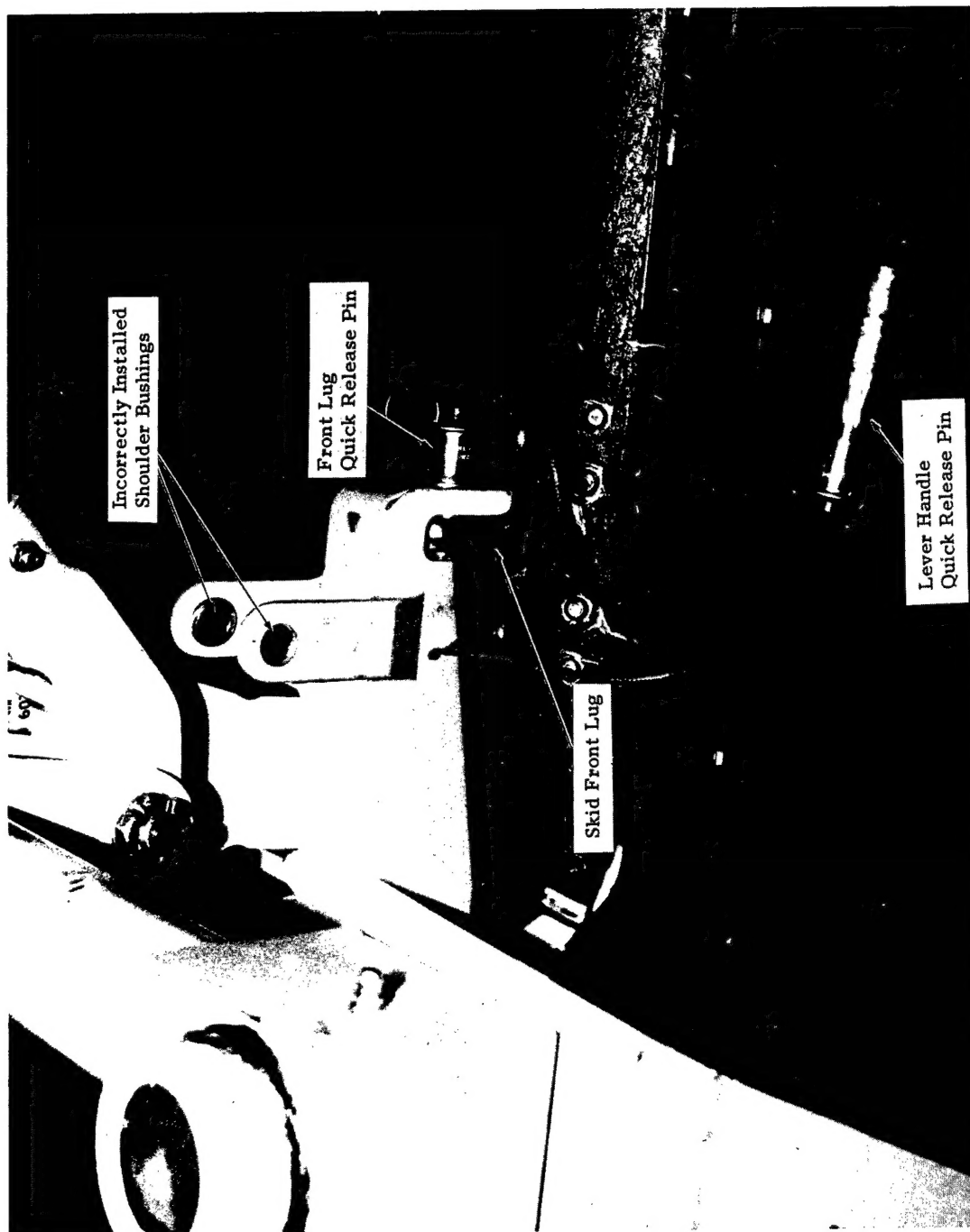


Figure 6  
Quick Release Pin Housing